44747

CORRES. CONTROL
INCOMING LTR NO.

03749 RF 94

DUE DATE

ACTION

DIST.	LTR	ENC
BURLINGAME, A.H.		
BUSBY, W.S.		
CARNIVAL, G.J.		
CORDOVA, R.C.		
DAVIS, J.G.		
FERRERA, D.W.		
FRAY, R.E.		
GEIS, J.A.		
GLOVER, W.S.		
GOLAN, P.M.		
HANNI, B.J.		
HEALY, T.J.		
HEDAHL, T.G.		
HILBIG, J.G.		
HUTCHINS, N.M.		
JACKSON, D.T.		
KELL, R.E.		
KUESTER, A.W.		
MARX, G.E.		
McDONALD, M.M.		
McKENNA, F.G.		
MORGAN, R.V.		
PIZZUTO, V.M.		
POTTER, G.L.		
SANDLIN, N.B.		
SATTERWHITE, D.G.		
SCHUBERT, A.L.		
SCHWARTZ, J.K.		
SETLOCK, G.H.		
STIGER, S.G.	X	X
TOBIN, P.M.		
VOORHEIS, G.M.		
WILSON, J.M.		
Keith, S.R.	X	X
Ledford, A.	X	X
Ogg, R.	X	X
Hollowell, L.	X	X
CORRES. CONTROL	X	X
ADMN RECORD/080	X	2
PATS/T130G		

Reviewed for Addressee
Corres. Control RFP

10-3-94 DATE   BY

Ref Ltr. #

DOE ORDER # 5400.1

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Department of Energy
Rocky Flats Field Office

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OCT 3 2 10 PM '94

ROCKY FLATS PLANT
EG&G
CORRESPONDENCE CONTROL

SEP 29 1994

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ER:FRL:09678

Review of Evaluation of Specific Methods to Prevent Groundwater Contamination, Operable Unit No. 4, Solar Ponds

Steve R. Keith
Program Director, Solar Pond Project
EG&G Rocky Flats, Inc.

The Environmental Protection Agency (EPA) has completed their review of the specific methods to prevent groundwater contamination in Operable Unit No. 4. Please find attached a copy of the EPA evaluation and the Department of Energy's comments on that evaluation.

If you have any question, please contact me at extension 7846.

Scott R Grace, for
Frazer R. Lockhart
Director, Environmental Restoration
Major System Acquisition

Attachment

cc w/Attachment:
J. Roberson, AMER, RFFO
M. Witherill, SAIC
S. Howard, SAIC
S. Stiger, EG&G
A. Ledford, EG&G
R. Ogg, EG&G

ADMIN RECORD

A-OU04-001662

ATTACHMENT 1

REVIEW OF THE EVALUATION OF SPECIFIC METHODS TO PREVENT GROUNDWATER CONTAMINATION OPERABLE UNIT (OU) 4 - SOLAR EVAPORATION PONDS, ROCKY FLATS PLANT

not the purpose of the study.

GENERAL COMMENTS

1. Incomplete and insufficient rationale is provided for rejecting a slurry wall alternative. A balanced analysis of alternatives should be provided. Assumptions made about the slurry wall and subsurface drain should be scrutinized more closely and in an objective manner.

   - The report states that the upgradient collection trench is susceptible to clogging and is therefore disadvantageous. First, the necessity of the upgradient diversion and collection trench is questionable. It is possible that the natural alluvium could serve the same purpose. While increased hydraulic head may exist on the upgradient side of the slurry wall without a collection trench, it is not known if this increased hydraulic head will prevent the slurry wall from meeting its performance objectives. The increase in hydraulic head should be estimated and its impact on slurry wall performance should be evaluated.

     ?? No, Can't be determine w/o modeling. Beyond scope

   - The document states that the depth of competent bedrock and uncertainties associated with keying the entire slurry wall into competent, low-permeable bedrock make the effectiveness of the slurry wall difficult to verify and demonstrate. It is not clear what bedrock hydraulic conductivity is required for the slurry wall to be successful. The document states that the slurry wall must be keyed into unfractured bedrock to be successful. This assumption is questionable, as fractured bedrock also has a low hydraulic conductivity. The bedrock does not need to have lower hydraulic conductivity than a slurry wall, which are typically designed to have a hydraulic conductivity of approximately 10E-06 centimeters per second (cm/sec). The report should specify permeability requirements and state what permeability can be expected from fractured bedrock. If unfractured bedrock is required, it will be difficult to detect the transition between fractured and unfractured bedrock during trenching and a slurry wall would not be implementable. If weathered bedrock is sufficient for slurry wall construction, borehole logs indicate a slurry wall depth of approximately 20 to 25 feet would be required.

     No. Modeling beyond scope. 25ft ≈ 35ft for this exercise.

   - The report states that the schedule would be delayed because additional field work and modeling would be required to demonstrate slurry wall effectiveness. Available geophysical and geologic borelog data appear sufficient at the Solar Evaporation Ponds to demonstrate whether the slurry wall can be effective. Specific data gaps should be identified. In addition, it seems that the lateral subsurface drain will also require additional modeling and analysis to demonstrate effectiveness. It does not appear that a clear cost/schedule benefit is associated with the lateral drain. The report should clarify how the subsurface drainage layer effectiveness will be demonstrated and the impact that this analysis will have on the schedule.

     No. Only makes sense for parallel design. No parallel design

General scope only,

- The report states that soil may have to be imported to obtain an effective soil-bentonite mixture. This is not a significant undertaking and it is not clear why this is a notable disadvantage. The report also states that displaced slurry presents a disposal problem. It is not clear why this material could not be consolidated under the cap.

Agreed.

- The report states that the cost of the subsurface drain is expected to be less than the slurry wall and collection trench. Given the magnitude of the overall project cost, the cost differential is not significant. Furthermore, almost 80 percent of the vertical groundwater control system cost is for the collection trench. As stated above, the need for the trench is questionable. If it is not required, the slurry wall will have lower expected costs.

No contradiction, the issue is can't tell which it is that a lot more work.

- The report states that a slurry wall may interfere with future sitewide groundwater corrective action alternatives. It also states that the slurry wall may expedite collection and treatment of groundwater from the upgradient industrial areas. This contradiction should be clarified because it invalidates the rationale.

- The slurry wall offers an advantage that appears to be overlooked. The disposal cell will have increased capacity for additional waste because the slurry wall does not require a 28 inch-thick drain layer to be installed beneath the fill. Conversely, if capacity is not increased, improved slope stability will be realized. In addition, the merits of decreased soil handling and associated risks are not given appropriate consideration and are downplayed in the report.

True, but not 28".

2. The report fails to use borehole logs from the numerous geologic borings in the OU4 area to determine the depth to which the slurry wall must be keyed into bedrock. Eight bedrock borings lie directly on the proposed alignment. These borings were all continuously sampled and geologic contacts were evaluated using a standard set of criteria. These borings should provide data to check the accuracy of the seismic profiles. Furthermore, about 25 bedrock boreholes exist within 200 feet of the Solar Ponds. Most of these borings were drilled to competent bedrock. The elevations of various geologic horizons (top of bedrock, top of unweathered bedrock, base of subcropping sandstones) can be extracted from these logs and easily analyzed by plotting contour maps by hand or with a computer contouring package. This would provide three-dimensional surfaces that can be used to estimate the average depth of the slurry wall.

Data used is sufficient for scoping level determinat

3. The 35-foot depth to competent bedrock cited in the report for the slurry wall design depth was obtained from geophysical line 2 (Figure 4.3), which is parallel to the north edge of the Solar Ponds. Figure 4.4 shows that the alignment of the slurry wall will parallel all or part of the western, eastern, and southern edges of the Solar Ponds, but will not parallel the north edge. Geophysical lines conducted at the other three edges show that the depth to competent bedrock rarely exceeds 20 feet, and that the greatest depth to competent bedrock beneath the

For this exercise 35 ft. is not much different from 20 ft.

solar ponds is approximately 31 feet below the northern half of Pond 207-A (from boring 42193). Elsewhere along the alignment, existing data indicate that a 20-foot design depth will be sufficient. Cost and effectiveness of the two systems should be reevaluated using 20 to 25 feet to bedrock for the slurry wall system. Cost and effectiveness should also be factored without the paired interceptor trench, unless rationale can be provided for its inclusion. Currently, a much longer slurry wall is being planned to encircle the OU7 landfill closure. This slurry wall, as currently planned, does not have a paired collection trench.

Not a 1000 yr. closure.

4. The report does not evaluate the effectiveness of the subsurface drain and slurry wall under equivalent criteria and appears predisposed towards a subsurface drain. The ability of a subsurface drain to remove water from below the waste is not discussed. The document states on Page 9 that the drain will be sloped to conduct intercepted groundwater away from the capped material and discharge water to the north hillside. It is not clear if the gravel will provide sufficient hydraulic conductivity to induce horizontal flow in the drain, terminate groundwater rise, and subsequently remove water from under the cap. It also seems possible that the water could discharge to the hillside regardless of the presence of the drain. It seems that, similar to the slurry wall, modeling would be required to determine the proper thickness and slope of the drain. Details should also be provided to show where the drain will daylight so that its function can be evaluated under the assumed hydraulic conditions.

Yes. This is clearly a comparison of a challenger to the baseline. It was not intended to be balanced.

Maybe.

Yes, design issue.

Design issue - Check basic physics and first principles.

5. Analytical solutions presented for the impact of the two alternatives on groundwater flow do not appear to be used in the comparative analysis. Furthermore, the discussion of the analytical solutions are vague and not useful. On Pages 11 through 15, analytical solutions are given for the lateral subsurface drain. The lateral drain depicted in Figure 3.2 does not resemble the drain discussed in the OU4 IM/IRA text. In addition, Figure 3.2 depicts an impermeable layer below the drain that would prevent the drain from functioning as intended. Also, page 19 presents calculations for flow discharge from the collection trench. The variables are not clearly defined and the basis for the chosen input values are unclear and poorly supported. Overall, the analytical solutions seem irrelevant to the analysis and only add bulk to the report. The value of the solutions in the decision-making process should be clarified or they should be removed from the analysis.

6. The report suggests that upward vertical hydraulic gradients from the lower hydrostratigraphic unit (LHSU) to the upper hydrostratigraphic unit (UHSU) are responsible for a water level rise observed at the Solar Ponds area. This hypothesis is poorly supported and contradicts the

conclusions of a recent study of vertical hydraulic gradients at Rocky Flats. The Rocky Flats Well Evaluation Report concluded that downward vertical hydraulic gradients exist at the Solar Ponds and other topographically high portions of the plant. Upward vertical hydraulic gradients are found only in drainage bottoms. These conclusions are based on 8 years of data (all seasons) at 25 well clusters around Rocky Flats Plant, five of which are located around the Solar Ponds. All five of these well clusters show downward gradients.

So, this only impacts whether solid bedrock is the basement. Again bottom is 10-15 ft

In contrast, this report bases its interpretation on a single hydrograph for piezometer 41193 that spans a 6-month time period. The text claims that "this hydrograph (piezometer 41193) does not show a definitive response to the precipitation events...therefore, the lower bedrock strata may locally recharge the UHSU." This hydrograph, however, depicts only one significant water level rise, which occurred during the month of April. This double-peaked water level rise appears to be in phase with two rainfall events that occurred just a few days earlier. The hydrograph does not exhibit much response to a larger rainfall event in June and two events in early September; there is only a minor deflection of the overall water level decline after the largest event. This behavior shows excellent seasonal response to precipitation events, as described in the vadose zone conceptual model included in the OU4 IM/IRA Decision Document, which states: "recharge through the vadose zone at OU4 is seasonal and occurs primarily during the late winter through spring when precipitation exceeds bare soil evaporation and plant transpiration." It should be noted that the response displayed on this hydrograph was apparently significant to the author of the OU4 IM/IRA Decision Document, as the 4-day lag time between rainfall and water level rise observed at piezometer 41193 was used to calculate a vertical hydraulic conductivity for vadose zone soils at OU4.

Scoping analysis - Data source is adequate.

The hypothesis presented contradicts conclusions from other reports that are better documented and supported. If there is compelling evidence to suggest that the conclusions of the Well Evaluation Report regarding vertical hydraulic gradients are incorrect (such as hydrographs from UHSU/LHSU well clusters), it should be presented to support the argument that upward vertical hydraulic gradients exist during the spring. If not, the hypothesis should be deleted and any previous conclusions drawn should be reconsidered.

7. Collection trench clogging is stated several times as a disadvantage of the collection trench. However, it seems that clogging could also occur from solids entering the subsurface drain along the upgradient edge of the drain. Maybe so, but far less likely. Check effects of gravity.